A REVISION OF THE BRITISH EOCENE CEPHALOPODA.

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PLATE X.

The first attempt to systematically describe the British Eocene Cephalopoda was by Mr. F. E. Edwards,[1] who also figured every species known at that time. Since then additional material has been collected and some new species described. Moreover, our knowledge concerning the Cephalopoda has considerably increased; and it seems to us that the time has arrived when a revision of the whole is highly desirable. Our present contribution to the subject principally consists, besides briefly diagnosing all genera and species, in recognising the true position of the remains hitherto referred to Edwards' genus *Belemnosis*, for years an enigma to palæontologists; in defining the type of the genus *Hercoglossa*, Conrad; and in describing a better preserved specimen of *Hercoglossa Cassiniana*, Foord and Crick, than any hitherto known, and one which throws much additional light on the essential characters of that interesting species. Our observations are based almost entirely on specimens in the British Museum (Natural History), which is extremely rich in English Tertiary Cephalopoda. It is probable that an examination of other collections would have enabled us to give a few additional localities for certain species, but our aim has rather been directed to a revision of the known forms than to a consideration of their geographical distribution.

The authors wish to express their obligations to Mr. G. C. Crick, F.G.S., for many useful suggestions made to them during the preparation of this paper, and to Mr. F. A. Bather, M.A., for his suggestion respecting the possible relationship existing between *Belemnosis* and *Spirulirostra*.

Class CEPHALOPODA.

Order DIBRANCHIATA.

Family BELOSEPIIDÆ.

Genus BELOSEPIA, Voltz.

Mém. Soc. Hist. Nat. Strasbourg, 1830, vol. i. pp. 22, 23.

Type.—Beloptera sepioidea, Blainville, Man. Malacologie, 1825, p. 622; 1827, Atlas, pl. xi. fig. 7.

Dorsal surface of the belosepion coarsely granulated, smooth internally, furnished with a solid and more or less acute rostrum,

[1] Monograph Palæontographical Society, 1849.

which is inflected dorsally. At the base of the rostrum is an expanded semi-circular plate having a radiated surface and a serrated margin. The posterior extremity contains a short slightly curved phragmocone, with remains of thin semi-lunate septa.

In defining his genus *Beloptera*, Blainville[1] included in it two species, viz. *Beloptera sepioidea* and *B. belemnoidea*. Under ordinary circumstances, therefore, we should regard the first-mentioned species as the type of *Beloptera*, and place *Belosepia* under the generic synonomy, when another name would have to be given to the group of which *B. belemnoidea* is the type. There is, however, no necessity for making this alteration, since Blainville himself in a later work[2] expressly states that he regards the last-mentioned species (erroneously referred to *B. belemnitoidea*) as the type of *Beloptera*.

Belosepia sepioidea, Blainville. Pl. X. Figs. 1–3.

Os de Sèche, Cuvier.—Ann. Sci. Nat. Paris, 1824, vol. ii. p. 482, pl. 22, figs. 1, 2.

Beloptera sepioidea, Blainville.—Man. Malacologie, 1825, p. 622; 1827, Atlas, pl. xi. fig. 7.

Sepia Cuvieri, D'Orbigny.—Ann. Sci. Nat. Paris, 1826, vol. vii. p. 157, *non* Deshayes.

Beloptera sepioidea, J. de C. Sowerby.—Mineral Conchology, 1828, vol. vi. p. 183, pl. 591, fig. 1.

Belosepia Curieri, Voltz.—Mém. Soc. Hist. Nat. Strasbourg, 1830, vol. i. p. 22, pl. ii. fig. 6.

Sepia longispina } Deshayes.—Coq. Foss. Paris, 1835, vol. ii. p. 757,
,, *longirostris* } pl. ci. figs. 4–6, 10–12.

Belosepia sepioidea, vars. *longirostris* and *longispina*, Edw.—Mon. Pal. Soc. 1849, pp. 29, 30, pl. i. figs. 1*a*–1*f*.

Belosepia Curieri
,, *Blainvillei?*
,, *longispina*
,, *longirostris*
} J. de C. Sby.—Dixon's "Sussex," 1850, pp. 109, 193, 194, pl. ix. figs. 10, 11 (top figure), 12, 15.

Belosepia sepioidea, Deshayes.—Desc. Anim. sans Vert. 1865, vol. iii. p. 617. R. B. Newton.—Syst. List Edwards Coll. British Museum, 1891, p. 288.

Belosepion elongate; dorsal surface arched, acute posteriorly, expanding anteriorly, covered with prominent, nodular granules arranged in curved lines parallel with the anterior margin; sides almost vertical, feebly granulated. Rostrum elongated, with ventral surface straight or bent towards the dorsal aspect; dorsal surface slightly arched and presenting a sharp edge. Callus narrow, compressed, and very rugose; ventral plate situated beneath the rostrum, almost horizontal, but broadly undulating, superior margin nearly semi-circular, posterior margin semi-elliptical, ventral surface of the

[1] Man. Malacologie, 1825, p. 622.
[2] Mém. Bélemnites, 1827, p. 111.

plate has radiating sulci starting from the apex, posterior margin well denticulated. Common.

Our figures of this species give different views of the largest and most perfect specimen yet recorded from Bracklesham. The dorsal aspect exhibits an almost perfect sheath, with its upper convex surface highly ornamented with prominent granulations arranged in semi-circular rows. The lower surface shows a well-developed ventral plate with its strongly radiate structure and serrated outline. The vertical sides of the specimen, together with the fragmentary rostrum, are well seen in the profile.

Entire length of specimen	69 mm. (nearly $2\frac{3}{4}$ in.).
Maximum width of sheath	31 ,,
,, ,, across ventral plate	33 ,,
Depth from top of sheath to base of ventral plate	22 ,,

Formations and Localities.—Barton Beds: High Cliff. Bracklesham Beds: Bracklesham Bay, Bramshaw, Huntingbridge, Brook, and Stubbington. London Clay: Sheppey and near Whetstone.

Belosepia Oweni, J. de C. Sowerby.

Béloptère de Cuvier } Blainv.—Mém. Bélemnites, 1827, p. 110, pl. i.
Beloptera sepioidea } fig. 2, *non* Blainv. 1825.
Sepia Cuvieri, Desh.—Coq. Foss. Paris, 1835, vol. ii. p. 758, pl. ci. figs. 7–9, *non* Orbigny, 1826.
Belosepia Curieri, Edwards.—Mon. Pal. Soc. 1849, p. 31, pl. i. figs. 3*a*–3*d*.
Belosepia Oweni } J. de C. Sby.—Dixon's "Sussex," 1850, pp. 109,
,, *brevispina* } 193, pl. ix. figs. 13*a*, 13*b*, 14.
Belosepia Oweni, R. B. Newton.—Syst. List Edwards Coll. British Museum, 1891, p. 288.
Belosepia Cuvieri, Cossmann.—Ann. Soc. R. Mal. Belgique, 1892, vol. xxvi. p. 11.

Rostrum shorter, thicker, and broader than in *B. sepioidea*, and more inclined towards the dorsal surface, whilst the ventral plate is less elliptical and the denticulations not so prominent. Callus nearly perpendicular to axis of rostrum. M. Cossmann alludes to this species as *B. Cuvieri*, Blainv., but on reference to Blainville's work we find that he merely designated it "Le Béloptère de Cuvier, *B. sepioidea*," and that, therefore, the name *B. Curieri* was never proposed by him. M. Deshayes seems to have fallen into the same error, for he called it *Sepia Cuvieri*, a name, however, which cannot stand, because it had already been proposed by D'Orbigny for a different mollusc, though in this instance also the name cannot be accepted since it is a synonym for *B. sepioidea*, Blainv. Sowerby's name must therefore be adopted for this species, as has already been pointed out by one of us.[1] *B. brevispina*,

[1] See R. B. Newton quoted in the synonymy.

J. de C. Sby., is characterized principally by the direction of its rostrum, an unimportant feature, and one which does not entitle it to rank higher than an extreme form of *B. Oweni*. Rather rare.

Formation.—Bracklesham Beds. *Localities.*—Bracklesham Bay and Bramshaw.

Belosepia Blainvillei, Deshayes.

Sepia Blainvillei, Desh.—Coq. Foss. Paris, 1835, vol. ii. p. 758, pl. ci. figs. 13–15.

Belosepia sepioidea, var. *Blainvillei*, Edwards.—Mon. Pal. Soc. 1849, p. 29, pl. i. figs. 1*g*–1*i*.

Belosepia Blainvillei, J. de C. Sby.—Dixon's "Sussex," 1850, pp. 109, 193, pl. ix. figs. 16, 17. Desh.—Desc. Anim. sans Vert. 1865, vol. iii. p. 616. R. B. Newton.—Syst. List Edwards Coll. British Museum, 1891, p. 287.

Although Edwards regarded this merely as a variety of *B. sepioidea*, there seem to be good grounds for its separation on account of the more massive structure and the greater width and ellipticity of the dorsal surface. The slit at the extremity of the rostrum alluded to by some authors appears to be due to erosion, which has removed the outer surface and revealed part of the internal structure. Rather rare.

Formations and Localities.—Bracklesham Beds: Bracklesham Bay. London Clay: Sheppey and Highgate Tunnel.

Family BELOPTERIDÆ.

Genus BELOPTERA, Blainville.

Man. Malacologie, 1825, pp. 621, 622. Mém. Bélemnites, 1827, p. 111.

Type.—Belopteria belemnoidea, Blainv. (reference as above).

Characterized by the possession of more or less salient lateral expansions, and by having an entire conical and chambered cavity, joined to a terminal rostrum; dorsal region convex, ventral concave; siphon ventral.

It differs primarily from *Belosepia* by the presence of the lateral expansions, by its proportionately deeper and more obtuse rostrum, and by the absence of a ventral plate. The septa are relatively closer together and not so strongly arched.

Belopteria belemnoidea, Blainville.

Belopteria belemnoidea, Blainv.—Man. Malacologie, 1825, p. 622; 1827, Atlas, pl. xi. fig. 8.

Belopteria belemnitoidea, Blainv.—Mém. Bélemnites, 1827, p. 111, pl. i. fig. 3. J. de C. Sby.—Mineral Conchology, 1828, vol vi. p. 183, pl. 591, fig. 3. Desh.—Coq. Foss. Paris, 1835, vol. ii. p. 761, pl. c. figs. 4–6. Edw.—Mon. Pal.

Soc. 1849, p. 36, pl. ii. figs. 1*a*–1*g*. J. de C. Sby.—Dixon's "Sussex," 1850, p. 109, pl. ix. fig. 18. Desh.—Desc. Anim. sans Vert. 1865, vol. iii. p. 619.

Beloptera belemnoidea, R. B. Newton.—Syst. List Edwards Coll. British Museum, 1891, p. 289.

In this species the lateral expansions are very pronounced, and are opposite the point of junction with the conical cavity. The rostrum becomes gradually larger for about two-thirds of its length, and then diminishes towards the extremity. Rare.

Formation.—Bracklesham Beds. *Locality.*—Bracklesham Bay and Bramshaw.

Sub-genus Belopterina, Munier-Chalmas.

Bull. Soc. Géol. France, 1872, ser. II. vol. xxix. p. 530.

Type.—Beloptera Levesquei, Fér. and D'Orb., Hist. Nat. Céph. 1840, p. 295, pl. xx. figs. 11, 12.

Differs chiefly from the typical forms of the genus in the absence of true lateral expansions; whilst its ventral surface is furnished with an elevated, acute, and angular keel.

Beloptera Levesquei, Férussac and D'Orbigny.

Beloptera Levesquei, Fér. and D'Orb.—Hist. Nat. Céph. 1840, p. 295, pl. xx. figs. 11, 12. Edw.—Mon. Pal. Soc. 1849, p. 37, pl. ii. figs. 2*a*–2*e*.

Belopterina Levesquei, Mun.-Chalm.—Bull. Soc. Géol. France, 1872, sér. II. vol. xxix. p. 531.

Beloptera Levesquei, R. B. Newton.—Syst. List Edwards Coll. British Museum, 1891, p. 289.

Beloptera (*Belopterina*) *Levesquei*, Cossmann.—Ann. Soc. R. Mal. Belgique, 1892, vol. xxvi. p. 13.

The "lateral expansions" in this species are so rudimentary, being in fact only elevated carinæ, that certain French authors have denied their existence. In other respects it closely resembles *B. belemnoidea*. Very rare.

Formation.—London Clay. *Locality.*—Highgate.

Genus SPIRULIROSTRA, D'Orbigny.

Ann. Sci. Nat. Paris, 1842, sér. II. vol. xvii. [Zoologie], p. 374, pl. xi.

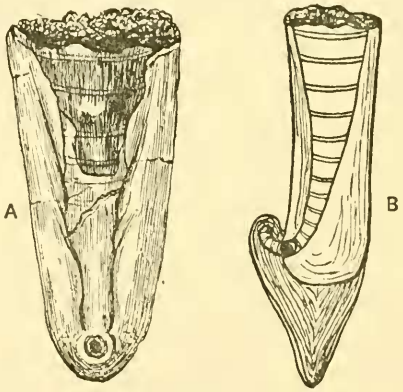
Belemnosis, Edwards.—Mon. Pal. Soc. 1849, p. 38.

Belemnopsis, J. E. Gray.—Cat. Moll. British Mus. Ceph. Antepedia, 1849, p. 157.

Type.—Spirulirostra Bellardii, D'Orb. Reference as above.

Test consisting almost entirely of an enormous rostrum, furnished in front with slight lateral expansions, and containing in the interior a spiral shell, which is cylindrical and septated, the septa being pierced on the inside by a continuous siphuncle.

We are much indebted to our friend, Mr. F. A. Bather, for the suggestion that the sole specimen upon which Edwards founded his genus *Belemnosis* might possibly be a rolled *Spirulirostra*. After having carefully compared the specimen with the figures of the latter genus published by its author, M. D'Orbigny, we are enabled to confirm that suggestion, in spite of the fact that at first sight there appears to be but little to support it. Edwards described his *Belemnosis* as consisting of "an elongated, semi-conical sheath, the apex of which expands into a short semi-cylindrical umbo pierced on the ventral surface, and inflected towards the ventral aspect." The principal distinguishing character of the genus, he remarked, was the large aperture "which forms a communication between the alveolar chambers and the sac in which the shell was lodged." Another important point was the absence of the elongated rostrum so characteristic of *Belosepia* and *Beloptera*. We give a figure (*A*) of *Belemnosis* in illustration of the diagnosis drawn up by Edwards.



Spirulirostra anomala.

A = Ventral aspect; enlarged nearly 4 times.
B = Ideal sectional restoration.

The presence of the ventral aperture, a character not possessed by any other genus of Cephalopoda recent or fossil, should rest on undisputed evidence, it seems to us, before it can be recognised as a true morphological feature; and, there being only one specimen known, this is entirely uncorroborated. Moreover, when that specimen is carefully examined, it is seen to be exceedingly smooth and rounded off at the edges; it does not possess the punctated character so common in its allies, *Belosepia* and *Beloptera*, whilst the margin of the aperture is fractured. From these and other considerations suggested by its general appearance we have no doubt that the specimen has been considerably rolled, and that the so-called ventral aperture is in reality only the initial chambers of the shell brought to light

by removal of a thin projecting part of the rostrum, consequent on the rolling action. The absence of an elongated rostrum may be similarly accounted for; indeed indications of its former presence are not wanting, some traces of its structure remaining on the smooth posterior extremity of the specimen.

We have, therefore, ventured to restore *Belemnosis* as represented in the annexed figure (*B*). It now presents considerable analogy with the genera *Beloptera* and *Spirulirostra*, but the former is characterised by a well-developed ventral paries, which is practically absent in our specimen. It agrees in most respects with the latter genus, in which the ventral paries is also very thin. The chambered shell in *Spirulirostra* has a considerable initial curvature, much greater than in *Beloptera*; and although the first few chambers are removed, according to our view, in the so-called *Belemnosis*, it seems clear from the disposition of the existing chambers that the shell had a greater curvature than that of *Beloptera*. Another point of similarity with *Spirulirostra* is the disposition of the septa, which are practically at right angles with the axis. We have no hesitation, therefore, in regarding *Belemnosis*, Edwards, as synonymous with the earlier *Spirulirostra*, D'Orbigny.

This conclusion is interesting from more than one point of view—(1) it removes an apparent anomaly, by accounting for the presence of this supposed ventral aperture, the function of which was certainly an enigma; (2) it enlarges the range in time of *Spirulirostra*, which has hitherto only been known to occur in the Miocene beds (Helvetian) of Northern Italy, whereas our specimen belongs to the Lower Eocene (London Clay); and (3) it adds another species to that genus, of which only one (*S. Bellardii*) has up to the present time been recorded, so far as we are aware.

Spirulirostra anomala, J. de C. Sowerby.

Beloptera anomala, J. de C. Sby.—Mineral Conchology, 1828, vol. vi. p. 184, pl. 591, fig. 2.

Belemnosis plicata, Edw.—Mon. Pal. Soc. 1849, p. 40, pl. ii. figs. 3*a*–3*e*.

Belemnopsis anomala, J. E. Gray.—Cat. Moll. British Museum Ceph. Antepedia, 1849, p. 158.

Belemnosis anomala, R. B. Newton.—Syst. List Edwards Coll. British Museum, 1891, p. 289.

This species differs from the type of the genus in that the later chambers of the shell are much more expanded, whilst its dorsal paries is very thick and keeled. Judging from D'Orbigny's figures of *S. Bellardii* it would appear as though the ventral paries of our specimen is thinner, whilst the contiguous outer sheath is slightly inflated and plicated. Mr. Edwards does not explain why he changed Sowerby's name for the species, and there seems no reason for so doing. Only one specimen known. Length, 13 mm.

Formation.—London Clay. *Locality.*—Highgate Archway.

Order TETRABRANCHIATA.

Family NAUTILIDÆ.

Genus NAUTILUS, Linnæus.

Type. — *Nautilus pompilius*, Linnæus, Systema Naturæ, 1767, ed. 12, vol. i. pt. 2, p. 1161.

Shell smooth, pearly, discoidal, camerated; septa concave anteriorly, perforated subcentrally for passage of siphuncle, which extends from the floor of the last chamber to the nucleus, and is protected by a sheath containing calcareous spicules[1]; sutures plain, curved; last or body chamber much larger than preceding ones, and bearing saddle-shaped impressions of muscles where the body of the animal adhered to its shell.

Nautilus centralis, J. Sowerby.

Nautilus centralis, J. Sby.—Mineral Conchology, 1812, vol. i. p. 11, pl. i. left-hand figure. J. de C. Sby.—Mineral Conchology, 1843, vol vii. p. 36, pl. dcxxvii. fig. 6. F. E. Edwards.—Mon. Pal. Soc. 1849, p. 45, pl. iii. figs. 1*a*–1*c*; pl. viii. fig. 2. J. de C. Sby.—Dixon's "Sussex," 1850, pp. 110, 121, 228, pl. xiv. fig. 28. Foord.—Cat. Foss. Ceph. British Museum, 1891, pt. II. p. 316. R. B. Newton.—Syst. List Edwards Coll. British Museum, 1891, p. 290.

Characterized by the central position of its siphuncle; shell very ventricose, much rounded on the ventral aspect; septa concave outwardly and simple; dorsal lobes broad. The specimen in the Edwards Collection alluded to by Mr. A. H. Foord, and said to have been found at Bracklesham (which we very much doubt), is so crushed and mutilated as to be unrecognisable.

Formation. — London Clay. *Localities.* — Sheppey, Hampstead Tunnel, Whetstone, near Chalk Farm, Bognor, Hyde Park, Hadley, Maida Hill, Primrose Hill.

Nautilus imperialis, J. Sowerby.

Nautilus imperialis, J. Sby.—Mineral Conchology, 1812, vol. i. p. 9, pl. i. (upper and right-hand figures). J. de Sby.—Mineral Conchology, 1843, vol. vii. p. 35, pl. dcxxvii. fig. 4. Edw.—Mon. Pal. Soc. 1849, p. 47, pl. v. pl. viii. fig. 1. J. de C. Sby.—Dixon's "Sussex," 1850, pp. 109, 120, 228. Foord.—Cat. Foss. Ceph. British Museum, 1891, pt. 2, p. 321. R. B. Newton.—Syst. List Edwards Coll. British Museum, 1891, p. 290.

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[1] For details concerning these spicules see paper by H. Brooks, "Preliminary remarks on the structure of the syphon and funnel of *Nautilus pompilius*." Proc. Boston Soc. Nat. Hist. vol. xxiii. (1888), p. 380, pl. i. Also *ante*, p. 3.

This species differs from *N. centralis* in that the siphuncle is not central, whilst the extremities of the dorsal lobes are broad and reflected. The shell is orbicular; septa lunate. Some authors have regarded *N. Lamarcki*, Desh., as synonymous with this, but we find that Sowerby's species is much more inflated and orbicular. Common.

Formations and Localities.—Bracklesham Beds: Bracklesham Bay. London Clay: Whetstone, Hampstead, near Chalk Farm, Woking, Sydenham, near Kew Bridge, Primrose Hill, Highgate Archway, Sheppey, Potter's Bar, Odiham, Norwood Tunnel, and Brentford.

Nautilus regalis, J. Sowerby.

Nautilus regalis, J. Sby. (?).—Mineral Conchology, 1822, vol. iv. p. 77, pl. cccl v. J. de C. Sby.—Min. Con. 1843, vol. vii. p. 35, pl. dcxxvii. fig. 5. Edw.—Mon. Pal. Soc. 1849, p. 46, pl. iv.; pl. viii. fig. 5. J. de C. Sby.—Dixon's "Sussex," 1850, pp. 121, 228. Foord.—Cat. Foss. Ceph. British Museum, 1891, pt. 2, p. 318. R. B. Newton.—Syst. List Edwards Coll. British Museum, 1891, p. 290.

Shell smooth, flattened on the sides, and roughly rounded; dorsal lobes short, rounded, deeply concave, and not reflected; siphuncle small and excentric. Easily distinguishable from the two preceding species by its umbilicus, which is closed by a thickening of the lip, so that the shell appears to have a solid axis. Its form is less ventricose than that of *N. centralis*.

Formation.—London Clay. *Localities.*—Chalk Farm, near Copenhagen House, Whetstone, Coast of Essex, Hornsey, Sheppey, near Chalk Farm, Potter's Bar, St. Katharine's Docks, Hyde Park, Boreham Wood, and Copenhagen Fields.

Nautilus Sowerbyi, J. de C. Sowerby.

Nautilus, n.sp., Wetherell.—Lond. & Edinburgh Phil. Mag. 1836, vol. ix. p. 466.

Nautilus Sowerbyi, J. de C. Sby.—Mineral Conchology, 1843, vol. vii. p. 35, pl. dcxxvii. figs. 1–3. Edw.—Mon. Pal. Soc. 1849, pl. vi. p. 48, pl. viii. fig. 3. J. de C. Sby.—Dixon's "Sussex," 1850, pp. 121, 228, pl. xiv. fig. 15. Foord.—Cat. Foss. Ceph. British Museum, 1891, part 2, p. 323. R. B. Newton.—Syst. List Edwards Coll. British Museum, 1891, p. 291.

Shell smooth, discoidal, lenticular; aperture triangular; septa very concave; the lateral lobe causing a deep sinus-like depression on each side, which is more developed than in *N. urbanus*, and slightly approaching *Hercoglossa Parkinsoni* in this respect; siphuncle near the dorsal margin. Rather rare.

Formation. — London Clay. *Localities.* — Bognor, Potter's Bar, Whetstone, Finchley, Holloway, Chalk Farm, Highgate, Sheppey, and Portsmouth (?).

NAUTILUS URBANUS, J. de C. Sowerby.

Nautilus urbanus, J. de C. Sby.—Mineral Conchology, 1843, vol. vii. p. 36, pl. dcxxviii. Edw.—Mon. Pal. Soc. 1849, p. 46, pl. iii. figs. 2*a*, 2*b*; pl. viii. fig. 4. J. de C. Sby.—Dixon's "Sussex," 1850, p. 228. Foord.—Cat. Foss. Ceph. British Museum, 1891, part 2, p. 320. R. B. Newton.—Syst. List Edwards Coll. British Museum, 1891, p. 291.

Distinguished from *N. centralis* by its flattened form and the greater length of its aperture; and from *N. regalis* by its open umbilicus, the truncated extremities of the dorsal lobes of the septa, and its discoidal shape. Lines of growth prominent and strongly decussated. Rare.

Formation.—London Clay. *Localities.*—St. Katharine's Docks, Sheppey, near Whetstone, and near Chalk Farm.

Genus HERCOGLOSSA, Conrad.

American Journal Conch. 1866, vol. ii. p. 101.

Type.—Nautilus Parkinsoni, Edwards, Mon. Pal. Soc. 1849, p. 49, pl. vii.

"Nautiloid; septa angular and linguiform; apex of the angle, or tongue-shaped lobe, not contiguous with the adjacent septum; siphon large or moderate, situated within the centre or between the middle and inner margin, and not dorsal or funnel-shaped, but tubular and gradually tapering.—*Nautilus orbiculatus*, Tuomey. This genus contains *Aturia Matthewsoni*, Gabb, and perhaps another from New Jersey. Eocene species, *Nautilus Parkinsoni*, Edwards. An undoubted species of *Aturia*, which is characterized by the funnel-shaped dorsal siphuncle, has not yet been found below the Eocene. Mr. Gabb does not describe the siphuncle or its position in his shell, and I have been guided only by the angles of the septa not being contiguous and its geological position in the Cretaceous formation. If Mr. Gabb will compare the specimens from Division A with those in Division B, and note the differences, if any, especially in the siphon, it will be important both in a stratigraphical and conchological point of view. My attention to this subject has very recently been called by the account of *N. Parkinsoni* in Edwards' Monograph of the Eocene Cephalopoda, and when I first saw the figure of *Aturia Matthewsoni* I had no doubt of its being an *Aturia*." —*Conrad.*

The above quotation embraces the whole of Conrad's original diagnosis and remarks on his genus *Hercoglossa*, a form which clearly occupies a transitional position between *Nautilus* proper and *Aturia*. The first species mentioned is *Nautilus orbiculatus*, Tuomey,[1] from the Cretaceous rocks of Alabama; but since it is insufficiently defined, and has not been figured, we are unable to accept it as the type of the genus. *Aturia Matthewsoni*, Gabb,[2] also of Cretaceous age, is next

[1] Proc. Acad. Nat. Sci. Philadelphia, 1854, vol. vii. p. 167.
[2] Geol. Survey California, Palæontology, 1864, vol. i. p. 59, pl. xvii. fig. 31.

referred to, though we cannot even recognise this as the type, because the characters of the siphuncle are not ascertainable either from the figure or description. The third species included by Conrad is the English Tertiary shell, *Nautilus Parkinsoni*, Edwards, the structure of which in all its details is so well understood that we have no hesitation in finally regarding it as the type of *Hercoglossa*. We had arrived at this conclusion before noticing that the late Dr. Paul Fischer[1] had apparently been led to a similar result.

Two years after the foundation of this genus, Conrad included in it another species, the *Aturia paucifex* of Cope,[2] alluding to it in a list of Cretaceous fossils from New Jersey as "*Hercoglossa paucifex*,"[3] a shell which has been recently re-described, and figured for the first time by Mr. R. P. Whitfield.[4] The genus ranges from Trias to Eocene times.

Hercoglossa Parkinsoni, Edwards.

"*Nautilite*," Parkinson.—Organic Remains, 1811, vol. iii. p. 105, pl. vii. fig. 15.

Nautilus Parkinsoni, Edwards.—Mon. Pal. Soc. 1849, p. 49, pl. vii.

Hercoglossa Parkinsoni, Conrad.—American Journ. Conch. 1866, vol. ii. p. 101.

Nautilus (Hercoglossa) Parkinsoni, Foord and Crick.—Annals, 1890, ser. VI. vol. v. p. 389.

Aturia Parkinsoni, Foord.—Cat. Foss. Ceph. British Museum, 1891, part 2, p. 347. R. B. Newton.—Syst. List Edwards Coll. British Museum, 1891, p. 292.

This rare species, represented by only two specimens, was first recognised by Conrad as belonging to his genus *Hercoglossa*, an opinion subsequently adopted by Messrs. Foord and Crick, though in a sectional sense. It attained to an enormous size and is probably the largest known Tertiary nautiloid shell. The tubular and gradually increasing nature of the siphuncle is well displayed in the Colchester specimen, the shell having been removed for this purpose. These details are observable at two periods of its growth, *viz.* at $2\frac{1}{4}$ inches and at 11 inches diameter. This species, as before explained, we regard as the type of *Hercoglossa*.

Formation. — London Clay. *Localities.* — Harwich (type) and Colchester.

Hercoglossa Cassiniana, Foord and Crick. Pl. X. Figs. 4, 5.

Aturia Cassiniana, Edw. MS.

Nautilus (*Hercoglossa*) *Cassinianus*, Foord and Crick.—Ann. Mag. Nat. Hist. 1890, ser. VI. vol. v. p. 409, woodcut fig. 9. A. H. Foord.—Cat. Foss. Ceph. British Museum, 1891, pt. 2, pp. 333–4, woodcut fig. 70.

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[1] Manuel Conchyliologie, 1882, p. 415.
[2] Proc. Acad. Nat. Sci. Philadelphia, 1866, pp. 3, 4 (not figured).
[3] Cook's "Geology of New Jersey," 1868, p. 731.
[4] Monographs United States Geol. Survey, 1892, vol. xviii. p. 246, pl. xxxix. fig. 1.

Hercoglossa Cassiniana, R. B. Newton.—Syst. List Edwards Coll. British Museum, 1891, p. 291.

Shell compressed, with flattened sides; periphery narrowly rounded; umbilicus closed; siphuncle near the dorsal margin. It somewhat resembles *H. Danicus* from the Upper Chalk, but may be readily distinguished by the position of its siphuncle, which in the Cretaceous species is nearly central, and by its more compressed whorls. The present species, although not quite a typical *Hercoglossa*, by reason of the absence of the tongue-shaped lobes, may be provisionally retained in that genus. The type specimen figured by Messrs. Foord and Crick being in such a fragmentary condition, we have deemed it advisable to figure the only other specimen in the British Museum (Natural History) from Sheppey, which is in a much better state of preservation. This exhibits very clearly the deep sinuous septa, as well as the structure of the exterior of the shell; the umbilicus is uncovered on the right-hand side. The opposite side, including the umbilical region, is much hidden by fragments of the outer portions of the shell, which are crushed into it. It is unfortunately not complete, several of the later septa being missing. The outer portion of the shell is covered with slightly sinuous, closely set, striæ; whilst some obscure lines, running spirally, cross these obliquely, producing reticulation in places. The specimen now figured is more tumid than the type, but we do not think there is sufficient evidence to warrant us in creating a new species. In some respects *H. Cassiniana* resembles the species of the genus *Cimomia*, Conrad,[1] but on reference to the figures of the type, *Nautilus Burtini*, Galeotti,[2] it will be seen that the sinuosity of the septa is much more pronounced in our shell than in the Belgian species referred to. The deep sinus observable in certain *Nautili*, and directed posteriorly on the dorsal portion of the septa, where the latter wrap round the preceding whorl, is well exemplified in *H. Cassiniana* by a deep longitudinal slit. Greatest diameter 50 mm.; width across the umbilical region 30 mm. Very rare, two specimens known.

Formation.—London Clay. *Localities.*—Finchley (type) and Sheppey (Figs. 4, 5).

Genus ATURIA, H. G. Bronn.

Lethæa Geognostica, 1838, vol. ii. pl. xlii. fig. 17, pp. 1122, 1123.

Type.—*Nautilus Aturi*, Basterot (= *Nautilite de Dax*, Montfort). Montfort.—Buffon's Hist. Nat., edited by Sonnini, 1802, Mollusques, vol. iv. pp. 240, 252, pl. xlvi. fig. 1. Basterot.—Mém. Soc. Hist. Nat. Paris, 1825, vol. ii. part 1, p. 17.

Shell compressed, involute, not umbilicated. Septa numerous, with an angular lobe on each side, directed posteriorly, and abutting against

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[1] American Journal Conch. 1866, vol. ii. p. 102.

[2] Burtin, Oryctog. Bruxelles, 1784, pl. xiv.; Galeotti, Mém. Cour. (4to.), 1837, vol. xii. p. 140.

the shell wall; dorsal portions of the septa prolonged backwards forming a large, marginal, funnel-shaped siphuncle, which is, perhaps, the most characteristic feature of the genus, and easily distinguishes it from *Hercoglossa*.

Aturia Charlesworthi, Foord.

Nautilus ziczac, Charlesworth.—Mag. Nat. Hist. 1837, n.s., vol. i. p. 533, fig. 66 (woodcut), *non* J. Sowerby, 1812.
Aturia ziczac, Bronn, *var. B.*, Edw.—Mon. Pal. Soc. 1849, p. 53, pl. ix. figs. 1*g*, 1*h*.
Aturia Charlesworthi, Foord.—Cat. Foss. Ceph. British Museum, 1891, part 2, p. 346. R. B. Newton.—Syst. List Edwards Coll. British Museum, 1891, p. 291.

Differs from *A. ziczac* in being more compressed, almost discoidal, narrower on the ventral aspect; dorsal lobes not so broad; aperture more elongated; septa very approximate, thirteen in a complete whorl. Extremely rare.

Formation.—London Clay. *Locality.*—Primrose Hill.

Aturia ziczac, J. Sowerby.

Nautilus ziczac, J. Sby.—Mineral Conchology, 1812, p. 12, pl. i. (lowest figure). Desh.—Coq. Foss. Paris, 1835, vol. ii. p. 765, pl. c. figs. 2, 3.
Aturia ziczac, Edw.—Mon. Pal. Soc. 1849, p. 52, pl. ix. figs. 1*a*–1*f*.
? *Clymenia ziczac*, J. de C. Sby.—Dixon's "Sussex," 1850, pp. 110, 194, pl. viii. fig. 19.
Aturia ziczac, Desh.—Desc. Anim. sans Vert. 1865, vol. iii. p. 628. Foord, Cat. Foss. Ceph. British Museum, 1891, pt. 2, pp. 342, 344, figs. 74*a*–74*b*. R. B. Newton.—Syst. List Edwards Coll. British Museum, 1891, p. 292.

Shell smooth, more or less ventricose, septa approximate and outwardly deeply concave, the lateral lobes taper rather suddenly towards the inferior extremity, siphuncle close to the dorsal margin. Rather rare.

Formations and Localities.—Bracklesham Beds: Bracklesham Bay. London Clay: Sheppey, Haverstock Hill, Highgate, near Chalk Farm, and Hampstead.

EXPLANATION OF PLATE X.

Fig. 1.—*Belosepia sepioidea*, dorsal view.
,, 2.— ,, ,, ventral view.
,, 3.— ,, ,, lateral view.
,, 4.—*Hercoglossa Cassiniana*, siphonal view.
,, 5.— ,, ,, septal view.